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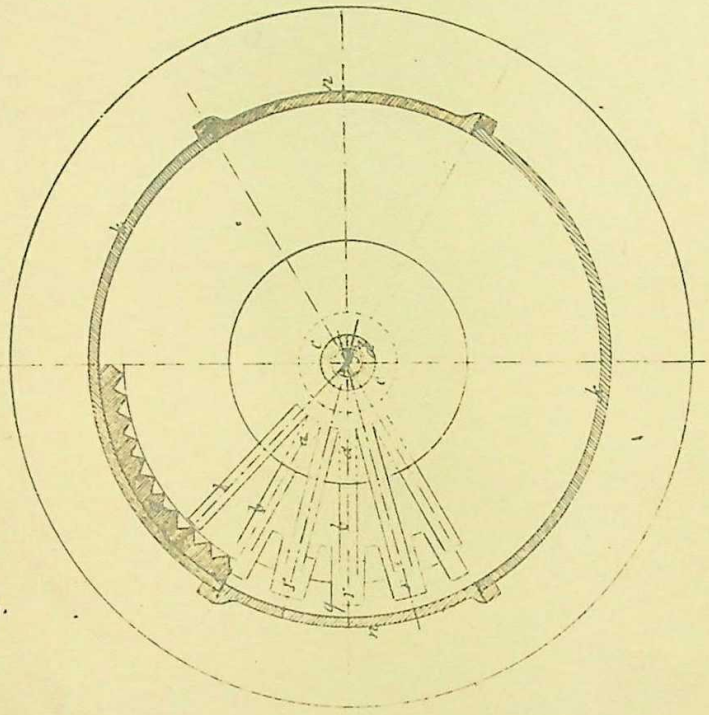
A.D. 1879, May 3. LNo. 2168.
LAKE'S SPECIFICATION.

Grinding Mills.
Rotary Beaters.

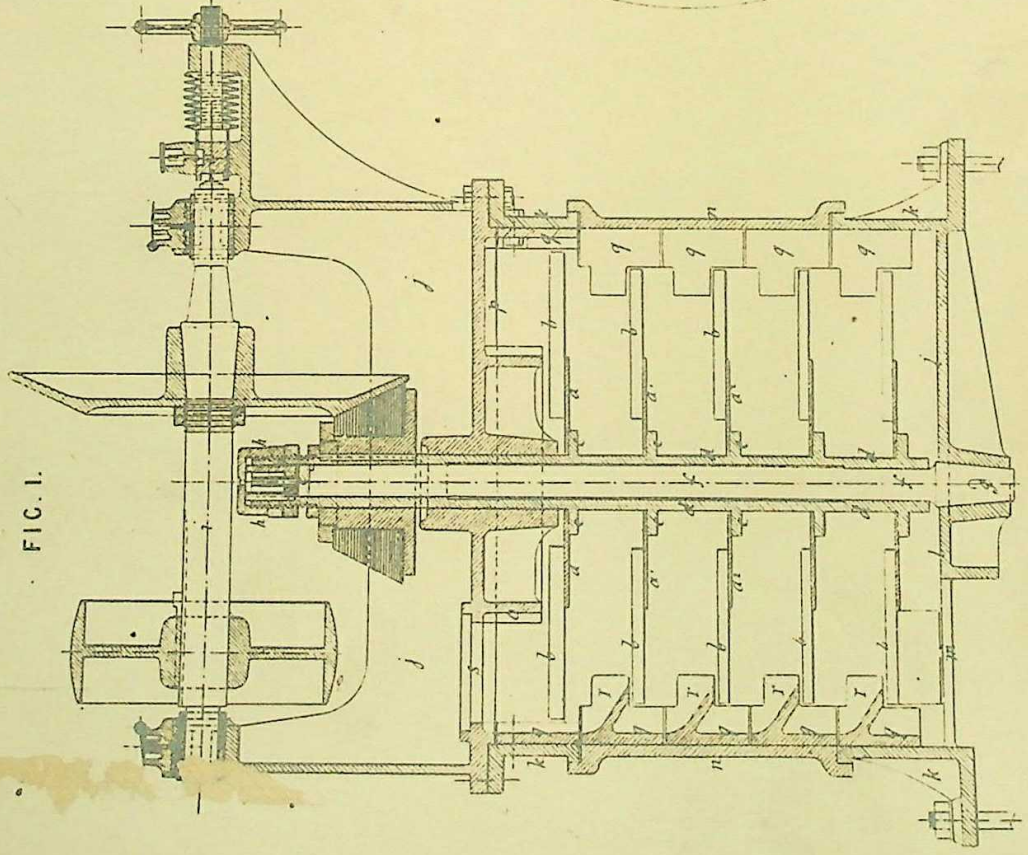
British

FIG. 2.



83. MILLS.
Grinding Mills:
Rotary Beaters.

FIG. 1.



Rotary Beaters

A.D. 1879, 31*st* MAY. N° 2168.

Pulverizing or Decorticating Machine.

LETTERS PATENT to Henry Harris Lake, of the Office of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London, for the Invention of "AN IMPROVED GRINDING, CRUSHING, PULVERIZING, OR DECORTICATING MACHINE." A communication from abroad by Casimir Déchamp, of Serville-les-Eaux, France.

Sealed the 25th November 1879, and dated the 31st May 1879.

PROVISIONAL SPECIFICATION left by the said Henry Harris Lake at the Office of the Commissioners of Patents on the 31st May 1879.

HENRY HARRIS LAKE, of the Office of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London. "AN IMPROVED GRINDING, CRUSHING, PULVERIZING, OR DECORTICATING MACHINE." [A communication from abroad by Casimir Déchamp, of Serville-les-Eaux, France.]

This Invention relates to an improved machine for grinding, crushing, pulverizing, or decorticating substances of various kinds.

The said Invention is based upon the principle that when the striking body possesses a greater speed than the speed of transmission of the shock from one molecule to another in the body struck while at rest it detaches sharply or suddenly from the latter the molecules which are found in its passage, whatever may be their hardness, itself incurring a loss or wear which is less according as its speed, bulk, and hardness are greater.

The apparatus constructed according to this Invention is composed of two principal parts, one moveable around a vertical axis, and the other fixed, serving as a casing to the first and as a support for the driving gear.

The movable part of the said apparatus is formed of a greater or less number of sheet iron plates, circular and horizontal, provided upon their circumference or periphery with spokes or arms of strong and rough steel of commerce, which arms are firmly bolted thereto. These plates, constructed in two pieces in order to

facilitate their being put into position, are riveted upon circular rims or flanges fixed upon a hollow shaft of cast iron arranged in the centre of the apparatus. The socket or bearing of this shaft is placed at the upper part, and its steel pivot rests by the medium of a block, which is also of steel, upon the upper extremity of a vertical shaft passing through the said hollow shaft, and fixed by a key upon the bottom of the casing. This pivot is keyed upon the upper extremity and to the interior of the hollow cast iron shaft.

The lubrication only takes place when the apparatus is in action and according to need, and the oil-chambers are perfectly protected from the dust which is produced in profusion in every kind of grinding apparatus. An iron cap screwed to the end of the hollow shaft supports all the movable part which effects the grinding or similar operations.

I employ ordinary friction driving gear, the shaft of which is solidly fixed in two plummer blocks supported by a cylindrical rib of a diameter nearly equal to that of the case of the apparatus. This driving gear may be of any suitable construction.

The fixed part of the said apparatus is composed of a cylindrical casing made of a single piece with the bottom, which has a wide aperture in it for the exit of the substances or matters treated, which are pushed there by two vertical pieces provided upon two of the armatures of the lower plate and at the extremities of the same diameter. A lower flange serves to fix the apparatus in place upon masonry or woodwork. Two doors are provided in the casing opposite to each other to facilitate the cleaning and repairing of the apparatus.

A cover is provided, made in one piece, and the aforesaid hollow axis passes through its centre. The cover is bolted upon the upper flange of the casing, and carries underneath a toothed ring around which is placed upon the cover itself a toothed part which forms with the top of the cylindrical casing and the armatures of the first plate a hollow ring of rectangular section.

In the interior the cylindrical and vertical surface of the casing is furnished on the whole of its circumference and without interruption from top to bottom with as many toothed or indented pieces as there are plates. Excepting the toothed piece of the first plate they form at the same time strainers or passages. These toothed or indented pieces are of very hard cast iron, rough from the foundry.

The substance or material to be treated being brought through one or more charging orifices to the spokes or arms of the first plate is there inevitably struck, for only an excessively short time elapses between the passing of two consecutive arms to the same point. The débris resulting from this first operation being thrown by centrifugal force against the casing is stopped by the teeth or indentations, and falls inevitably through the indented strainers or passages to the arms of the second plate, which strike them in their turn, and the substances arrive in the same manner upon the arms of the third plate, and thus in succession as many times as there are plates, so that the substances become reduced to impalpable powder by the time they arrive at the bottom of the apparatus, where the aforesaid pushing or removing pieces cause them to fall into any suitable receiver.

These strainers or passages have not only for their object the bringing back by the action of gravitation of the débris of increasing fineness resulting from the successive operations to the extremity of the arms of the next plate, but also to prevent the same débris, although fine, from being carried away with the air to which is given a rotating movement by the revolving portion of the apparatus; in this manner the substances are presented successively and without rapidity to the spokes or arms of the revolving plates, an eminently favorable and characteristic condition which allows them to be reduced with certainty into impalpable powder.

It will be understood that this system of grinding, pulverizing, and the like will allow as many variations as may be desired to be made in the nature of the substances to be treated and the state into which it is desired to reduce them. In fact, according to the nature of the substances, the state into which it is desired to

reduce them, and the quantity to be produced in a given time, it will be possible to make variations in the following particulars, that is to say :—

1st. The diameter of the apparatus.
2nd. The height from which the substance falls into the apparatus.
3rd. The speed of rotation of the movable parts.
4th. The number of reducing plates.
5th. The number of arms of each plate.
6th. The form and the length of these arms.
7th. The number of teeth in the cast iron pieces of the casing.
8th. The depth of these teeth or indentations.
9th. Their advancement beyond the strainers.

Knowing the influence of each of these particulars upon the result of the reducing operations it is easy to find the best conditions to be adopted in an apparatus which is desired to furnish in a given time a determined quantity of any substance in a state of pulverization more or less fine.

It will thus be understood that the apparatus may be used to pulverize the heaviest and hardest substances, as well as the lightest and softest. Moreover, this apparatus may be used advantageously either for decorticating, grinding, granulating, or even for simply crushing ; and lastly (the most difficult of all), may advantageously take the place of the mill as a pulverizer of materials into impalpable powder. This apparatus is at the same time a perfect mixer.

Lake's Improved Pulverizing or Decorticating Machine.

SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said Henry Harris Lake in the Great Seal Patent Office on the 29th November 1879.

HENRY HARRIS LAKE, of the Office of Haseltine, Lake, & Co., Patent Agents, Southampton Buildings, London. "AN IMPROVED GRINDING, CRUSHING, PULVERIZING, OR DECORTICATING MACHINE." A communication from abroad by Casimir Déchamp, of Serville-les-Eaux, France.

This Invention relates to an improved machine for grinding, crushing, pulverizing, or decorticating substances of various kinds.

The said Invention is based upon the principle that when a body striking another has a greater speed than that of the transmission of the shock from one molecule to another in the body struck when at rest the striking body detaches sharply or suddenly from the latter the molecules which are found in its passage, whatever may be their hardness, and the said striking body incurs a loss or diminution inversely in proportion to its comparative speed, bulk, and hardness.

My Invention is illustrated in the accompanying Drawing, in which,—

Figure 1 is a vertical section of my improved machine, and

Figure 2 is a horizontal section of the same.

It will be seen by reference to these Figures that my improved grinding apparatus is composed of two principal parts, one of which is movable around a vertical axis, and the other fixed and serving as a casing to the said movable part and as a support for the driving gear.

The movable part of the said apparatus is formed of a greater or less number of circular horizontal sheet iron plates a, a^1, a^2, provided upon their circumference or periphery with spokes or arms b of good wrought steel of commerce, which arms are firmly fastened thereto. These plates, constructed in two pieces in order to facilitate their being put into position, are rivetted upon circular rims or flanges c fixed upon a hollow shaft d, preferably of cast iron, arranged in the centre of the apparatus. The bearing of this shaft is near the upper part, and the shaft has a steel pivot which rests (through the medium of the block e, also of steel) upon the upper extremity of the vertical iron shaft f fixed by a key g in the bottom of the casing. This pivot is keyed upon the upper extremity and to the interior of the hollow cast iron shaft.

The lubrication only takes place when the apparatus is in action and when necessary, and the oil chambers are perfectly protected from the dust which is produced in profusion in every kind of grinding apparatus. An iron cap h screwed to the end of the hollow shaft supports all the movable part which effects the grinding or similar operations. The driving mechanism represented in the Drawing is an ordinary friction wheel whose shaft i is carried in two plummer blocks supported by a cylindrical piece j of a diameter nearly equal to that of the case of the apparatus. This driving mechanism may be of any suitable construction.

The fixed part of the said apparatus is composed of the cylindrical casing k made of a single piece with the bottom l, which has a wide aperture m in it for the exit of the ground substances or matters which are pushed there by two vertical pieces provided upon two of the spokes or arms of the lower plate, and of the same diameter as the said arms at their outer extremities or edges. The bottom flange serves to fix the apparatus in place upon masonry or woodwork. Two doors n are provided in the casing opposite to each other to facilitate the cleaning and repairing of the apparatus.

The cover of the apparatus is formed in one piece, and the aforesaid hollow axis passes through its centre. The said cover is bolted upon the upper flange of the casing and carries underneath a toothed ring o, around which is placed upon the cover itself a toothed part p which forms with the top of the cylindrical casing and the arms or spokes of the first plate a hollow ring of rectangular section.

In the interior the cylindrical and vertical surface of this casing is furnished on the whole of its circumference and without interruption from top to bottom with as many toothed or indented pieces q as there are plates. The said toothed pieces, with the exception of the toothed piece of the first plate are arranged in combination with inclined passages r, and are formed of very hard cast iron as it comes from the foundry.

The substance or material to be treated being fed through one or more charging orifices s to the spokes or arms of the first plate a is there inevitably struck, as only an excessively short time elapses between the passing of two consecutive arms at the same point. The débris or fragments resulting from this first operation being thrown by centrifugal force against the casing are stopped by the teeth or indentations and fall unavoidably through the inverted or inclined passages or channels to the arms of the second plate a^1, which strike them in their turn and the substances being treated arrive in the same manner upon the arms of the third plate a^2, and thus in succession as many times as there are plates, so that these substances become reduced to impalpable powder by the time they arrive at the bottom of the apparatus where the aforesaid pushing or removing pieces cause them to fall into any suitable receiver.

The said inclined passages have not only for their object the bringing back by the action of gravitation of the débris of increasing fineness resulting from the successive operations to the extremity of the arms or spokes of the next plate, but also to prevent the same débris, although fine, from being carried away with the air to which a rotary movement is imparted by the revolving portion of the apparatus; in this manner the substances are presented successively and without rapidity to the spokes or arms of the revolving plates, an eminently favorable and characteristic condition, which allows them to be reduced with certainty into impalpable powder.

It will be understood that this system of grinding, pulverizing, and the like will allow as many variations as may be desired to be made in the nature of the substances to be treated and the state into which it is desired to reduce them. In fact, according to the nature of the substances, the state into which it is desired to reduce them, and the quantity to be produced in a given time, it will be possible to make variations in the following particulars, that is to say, in,—

1st. The diameter of the apparatus.
2nd. The height from which the substance falls into the apparatus.
3rd. The speed of rotation of the movable parts.
4th. The number of reducing plates.
5th. The number of arms of each plate.
6th. The form and the length of these arms.
7th. The number of teeth in the cast iron pieces of the casing.
8th. The depth of these teeth or indentations.
9th. Their advancement beyond the inclined passages.

Knowing the influence of each of these particulars upon the result of the reducing operations it is easy to find the best conditions to be adopted in an apparatus which is desired to furnish in a given time a determined quantity of any substance in a state of pulverization more or less fine.

It will thus be understood that the apparatus may be used to pulverize the heaviest and hardest substances as well as the lightest and softest substances. Moreover, the said apparatus may be advantageously used either for decorticating, grinding, granulating, or even for simply crushing; and lastly (the most difficult of all), may advantageously take the place of the mill as a pulverizer of materials into impalpable powder. This apparatus is at the same time a perfect mixer.

Having thus fully described the said Invention as communicated to me by my foreign correspondent, and the manner of performing the same, I wish it understood that I claim the improved grinding, crushing, pulverizing, or decorticating apparatus herein described and shewn in the accompanying Drawing, the characteristic features of which are,—

First. The employment of a fixed casing furnished in the interior with vertical

and inclined channels or passages for constantly maintaining at rest the substance which is thrown there to be treated, and for returning it to the arms or spokes of the apparatus, as above set forth.

Second. The superposition in the said apparatus of any suitable number of grinding plates provided with spokes or arms, as above set forth.

Third. The combination of the fixed drum having interior channels with the plates having arms or spokes turning upon a vertical axis, as above set forth.

Fourth. The peculiar construction and arrangement of the parts of the said apparatus, substantially as shewn in the accompanying Drawing and as above set forth.

In witness whereof, I, the said Henry Harris Lake, have hereunto set my hand and seal, this Twenty-ninth day of November, in the year of our Lord One thousand eight hundred and seventy-nine.

HENRY H. LAKE. (L.S.)

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For Her Majesty's Stationery Office.

1879.